PSILOBETHYLUS IN THE NEW WORLD (HYMENOPTERA: BETHYLIDAE)

By W. L. Brown, Jr. and F. Y. Cheng
Biological Laboratories, Harvard University

The family Bethylidae is one of the most unsatisfactorily known of the larger hymenopterous assemblages. Present-day taxonomy is dependent upon the monograph of Kieffer in Das Tierreich (Lief. 41, 1914) and on such meager authentically determined material as exists in the larger collections of insects. Kieffer's work rests on a very poor basic literature, and furthermore, the monograph includes many elements like the dryinids, *Algoella*, *Embolemus*, etc. which cannot now be considered close to the bethylids. The subsequent removal of many of these tramontane groups does little to relieve the difficulty one meets in trying to use Kieffer's work for practical identification. These considerations, together with the scarcity of material for study, make taxonomic endeavor in the bethylids a frustrating experience.

Interest in a female bethylid received from Dr. F. Bonet of Mexico City led to attempts at identification by means of Kieffer's key (*op. cit.*), where we ran it down in the wingless division to couplet 26, p.233. The choice here given was: "Mesonotum und scutellum deutlich" or "Mesonotum oder scutellum fehlend." Our specimen had the mesonotum and scutellum apparently weakly separated, and we decided in favor of a doubtful identification "cf. *Psilobethylus*." From Kieffer's generic characterization (p. 274) the specimen differed in having four (*vs.* three) mandibular teeth, but otherwise, agreement was fair. Sent to Mr. C. F. W. Muesebeck, the female was identified as *Psilobethylus* and was returned promptly with nine very similar females from various parts of the United States.

Psilobethylus has hitherto been represented by three species from the Old World. Only one species, *Ps. luteus* Kieffer (genotype) from Europe, has been known from the female sex. The descriptions of *luteus* leave much to be

desired, and it is only with some doubt that the New World species are considered congeneric with the genotype. In view of the confusion presently holding among the bethylid genera, there seems little excuse for separating the American forms at this time. For better characterization, the males of the New World forms need to be discovered and the Old World ones to be redescribed.

The females of the New World forms are slender, yellowish or ferrugineous wingless wasps of very small size. The head is oblong and more or less depressed. The eyes are small and placed near the anterior quarters or fifths of the sides of the head. The antennae are 13-segmented, incrassate, the scapes especially so, and are inserted in pits close together on the extreme anterior part of the head. The clypeus and adjoining structures are much reduced and modified by fusion, so that the two depressions ventral to the processes upon which the antennae are inserted have become separated by a small but sharp vertical plate. The legs are of normal bethylid type, without peg-like spines.

The fusion of the clypeus with adjoining structures, the reduction of eyes and lack of strong pigmentation, and the incrassation of the antennae are modifications for hypogaeic or other cryptobiotic existence found also in other hymenopterous groups. Among the ants, certain dorylines and cerapachyines show similar modification, and the structural similarity has been used to support contentions that these two subfamilies are close in a phylogenetic sense. It need only be pointed out that the modifications shown by other, clearly distant groups like *Discothyrea* among the ants and *Psilobethylus* among the bethylids demonstrate that the phenomenon is one of multiple convergence and that it may not be trusted in attempting to establish relationships of systematic significance.

Little is known concerning the biology of the American forms. It is assumed that our forms follow the bethylid pattern of "parasitism" on other insect larvae. The collection data and obvious structural features of our females indicate that the hosts are hypogaeic in habit, at least during the stage at which attacked. The American

records for the wasps are all indicative of a habitat in the upper soil layers or at the level of the soil cover.

Among the relatively meager material at our disposal can be recognized what seem to be two distinct species, separable on the basis of size, proportion, sculpture and shape of head. The smaller and smoother of the two species, *lucidus* n. sp., is set up for specimens stemming from Illinois, West Texas, North Carolina and Tabasco in southern Mexico. In view of slight differences between individuals from these widely separated localities, it seems probable that *lucidus* contains more than one specific entity. The differences are so elusive, however, and the variation within series relatively so great that we cannot confidently assort them taxonomically without the corresponding males. It must be borne in mind that each of the locality-series probably represents the offspring of a single female. Such a situation creates constancy within series and differences between series that are often illusory in the systematic sense, since not only may the mothers show slight individual, non-taxonomic differences, but the hosts and the differing food supplies they afford may alter radically the structure of individuals from one brood to another. In fact, even the large, densely sculptured *foveolatus* may eventually prove to be nothing more than a form of *lucidus* arising through differential feeding. The differences in size, shape, and especially in sculpture are of such magnitude that we feel fairly confident in separating the two as species at the present time.

Psilobethylus foveolatus n. sp.

(Plate 13, figure 1)

Holotype female: Total (synthetic aggregate) length 2.20±.04 mm.; head length, maximum measurable, 0.53 ±.005 mm.; alitrunk length, maximum diagonal measurement in lateral view, 0.72±.01 mm.; cephalic index (maximum head width expressed as a percentage of head length) 75±1. Habitus as in figure, except that (in both figures 1 and 2) the insertions of the antennae are depicted more boldly and more strongly set off than they are in the actual

specimens. Body slender, gently depressed; head evenly convex dorsally, in lateral view suboval, with subtruncate posterior end. Eyes long-oval, with 10-12 coarse facets arranged in a double row, plus a very few other less well-developed facets. Sides of head gently convex, subparallel (see figure). Mandibles largely hidden when head is viewed from dorsal side; dentition as in figure 3. Maxillary palpi not clearly visible, but apparently much as described for *lucidus*. Labial palpi not visible. Alitrunk slightly depressed dorsally, in profile the dorsal outline nearly perfectly straight. Legs gently incrassate, profemora more strongly so.

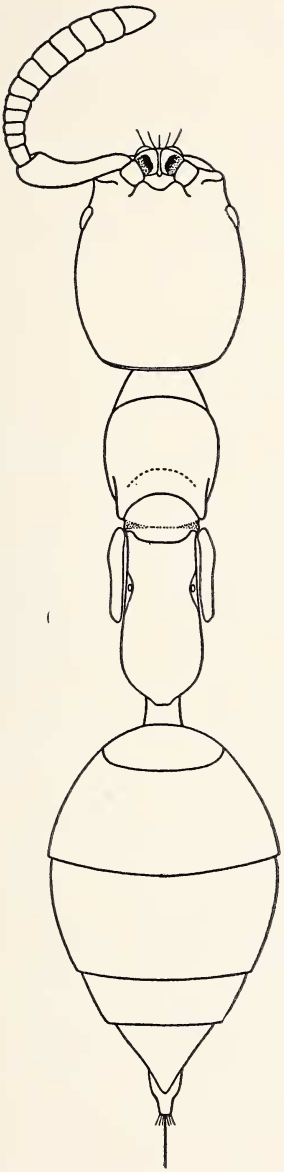
Dorsum and sides of head covered with small, densely arranged, umbilicate-piligerous foveolae, contiguous and subcontiguous on most of the sides and dorsum, but thinning out slightly in the extreme median dorsal region, where a very restricted area shows some "Scotch grain" coriaceous sculpture and is feebly shining. The greater part of the head is opaque. Alitrunk rather strongly and densely coriaceous, subopaque to opaque, with a few indistinct punctures. Mesonoto-scutellar sutural line moderately distinct. Propodeum feebly subrugulose in addition to the ground sculpture. Gaster smooth and shining. Legs, scapes and mandibles very feebly and finely punctulate-granulose, weakly to moderately shining.

Pilosity consisting of fine, tapered hairs, rather abundant and erect or suberect, but more nearly reclinate on the appendages, short to moderate in length and distributed rather evenly over the body. Color deep yellowish-ferrugineous; gaster brown, shading off to ferrugineous at both basal and apical extremities; legs and antennae clear yellow.

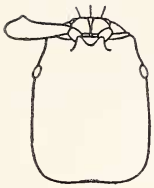
EXPLANATION OF PLATE 13

Fig. 1. *Psilobethylus foveolatus* new species, holotype female, Mt. Vernon, Virginia, dorsal view. Fig. 2. *Ps. lucidus* new species, paratype female, Santa Rosa, Tabasco, dorsal view of head. Fig. 3. *Ps. lucidus* new species, paratype female, Durham, North Carolina, external view of mandibular dentition.

Figures 1 and 2 are drawn to the same scale.



1



2

3

BROWN AND CHENG — PSILOBETHYLUS

Holotype deposited in United States National Museum; collected at Mt. Vernon, Virginia, Dec. 16, 1944, "in *Andropogon*" (J. C. Crawford).

A single paratype female, data and deposition as for holotype, is very similar to the holotype in every way except that the gaster is slightly differently expanded. The measurements and proportions, except for the total length difference due to gastric expansion, are within the errors stated for the holotype.

Psilobethylus lucidus n. sp.

(Plate 13, figures 2, 3.)

Holotype female: Similar to *Ps. foveolatus,* but smaller in size (see measurements below) and relatively more slender. Head more nearly perfectly oblong, with parallel, nearly straight sides, also more strongly depressed (index of cephalic depression 44±2). Eyes smaller, with only 5-8 facets evident in each. Dorsal surface of head extremely feebly convex dorsally, plane ventrally. In full-face view, posterior occipital border extremely feebly concave in the middle. Dorsum and sides of head with close but superficial "Scotch grain" coriaceous sculpture and a few sparse, widely spaced small piligerous punctures; the latter most numerous on the sides of the head, but even here not approaching in number or size the foveolae of the preceding species. Alitrunk with fine coriaceous sculpture much like that of head, but here punctulae are scarce and indistinct or altogether absent. Surfaces of head and alitrunk distinctly shining. Gaster smooth and shining.

Hairs a little less abundant and shorter than those of *foveolatus,* particularly on cephalic dorsum. Color as in *foveolatus,* but lighter, the gaster not so distinctly darkened in the middle. Other characters, except for certain slight proportional differences shown in the figure, as in *foveolatus.*

Holotype (U. S. National Museum) taken from the soil of a peach orchard in El Paso County, Texas, Nov. 2, 1936 (W. F. Turner, No. T-1872).

Paratypes, all females: Two specimens with the data as

for holotype were very similar to it, but were lighter and more yellowish in color, lacking the gastric infuscation. The total length in the El Paso County (type locality) series ranged for three specimens from 1.63 to 1.70 mm.[1] Head length 0.35-0.42; alitrunk length 0.45-0.56 mm.; cephalic index 66-69.

One of the two El Paso County paratypes was dissected, and the maxillary palpi proved to be composed each of one cigar-shaped segment with slender, curved base; the single segment bears a low welt on the lateral face near midlength. The labial palpi are two-segmented, the apical segment robust, ovoid, fitting snugly into the curved, trumpet-shaped basal segment. The palpal segmentation in combination with the mandibular dentition may prove of value at some future date in differentiating the American forms from those of the Old World in which the labial palpi are stated to have one segment.

One female (figure 2) from Santa Rosa, Tabasco, Mexico, in a Berlese funnel soil sample with ants and collembolans, Aug. 16, 1945 (F. Bonet). Total length 1.79 mm., head length 0.39 mm., alitrunk length 0.60 mm., cephalic index 71. This specimen is much like the holotype, but is pale yellow in color. The two basal teeth of the mandibular series are much reduced, smaller than as shown in figure 3.

Three specimens from Urbana, Illinois, Feb. 18, 1945 (J. L. C. Rapp) taken in soil. Like the holotype but head a bit more convex dorsally and ventrally and also at the sides, in this respect tending toward *foveolatus*. Size, color and particularly the very similar sculpture ally this sample with *lucidus* and not *foveolatus*. Cephalic index 75-78.

One specimen, Duke Forest, Durham, North Carolina, June 2, 1945, "oak on sand, 2 inches deep," (A. S. Pearse). Total length 1.99 mm., head length 0.43 mm., alitrunk length 0.62 mm., cephalic index 73. Head shape intermediate between those of Texan and Illinoian specimens.

[1] Conditions of measurement and range of error as in corresponding measurements for *Ps. foveolatus* n. sp.

Mandible shown in figure 3. Punctulation of head a trifle coarser than in holotype, but not closely approaching that of the *foveolatus* types; specimen rather dirty, of dullish coloration.

The paratype series has been returned to the collection of the U. S. National Museum. *Ps. lucidus* as presently conceived may be separated from the related *foveolatus* by the striking sculptural difference as well as by the probably less reliable characters of size, head shape, color, etc. Discovery of *Psilobethylus* males in association with females on this continent will probably lead to revision of the status of the forms here included in *lucidus*.

We wish to offer our thanks to Mr. Muesebeck and Dr. Bonet for their aid in sending material and in furnishing other information used in this paper.

Some Notes on Synonomy of the Mycetophilidae (Diptera). — In 1940 (Revista Ent., 11 :803-808), the author described several new species of Mycetophilidae from Costa Rica. Among these was included *Neoempheria neivai*. This publication appeared in December. Without the knowledge of the author, Dr. F. W. Edwards of the British Museum described some species of *Neoempheria*, including a *Neoempheria neivai* (Nov. Zool., 42:107-129). This paper appeared in April, 1940, and hence Edward's specific name *neivai* has priority. At this time I would like to rename my *Neoempheria neivai* and will substitute the name *phillipsi* for *neivai*. This name is selected in honor of Dr. E. F. Phillips whose untimely death during the past summer is greatly mourned.

During the current year, 1951, the author published descriptions (Bull. Brooklyn Ent. Soc., 46:65-70) of new Mycetophilidae from western United States. In these was included a new species which I named *Exechia ligulata*. Laffoon, in correspondence, has recently indicated that the name *ligulata* was a homonym having been used by Lundstrom in 1913. Hence I will substitute the specific name *subligulata* for my *ligulata*. F. R. Shaw, University of Massachusetts.